Chapter : 13. VOLUME AND SURFACE AREA

Exercise : 13A

Question: 1

(i) length = 12 cm, breadth = 8 cm and height = 4.5 cm

Volume of cuboid = (length × breadth × height) = (12 × 8 × 4.5) = 432 cm^3

Lateral surface area of cuboid = 2(length + breadth) × height = 2(12 + 8) × 4.5 = 180 cm^2

Total surface area of cuboid = 2(length × breadth + breadth × height + height × length)

= 2(12 × 8 + 8 × 4.5 + 4.5 × 12) = 2(96 + 36 + 54) = 2 × 186 = 372 cm^2

(ii) length = 26 m, breadth = 14 m and height = 6.5 m

Volume of cuboid = (length × breadth × height) = (26 × 14 × 6.5) = 2366 m^3

Lateral surface area of cuboid = 2(length + breadth) × height = 2(26 + 14) × 6.5 = 520 m^2

Total surface area of cuboid = 2(length × breadth + breadth × height + height × length)

= 2(26 × 14 + 14 × 6.5 + 6.5 × 26) = 2 × 624 = 1248 m^2

(iii) length = 15 m, breadth = 6 m and height = 5 dm = (0.5m)

Volume of cuboid = (length × breadth × height) = (15 × 6 × 0.5) = 45 m^3

Lateral surface area of cuboid = 2(length + breadth) × height = 2(15 + 6) × 0.5 = 21 m^2

Total surface area of cuboid = 2(length × breadth + breadth × height + height × length)

= 2(15 × 6 + 6 × 0.5 + 0.5 × 15) = 2(90 + 3.0 + 7.5) = 2 × 100.5 = 201 m^2

(iv) length = 24 m, breadth = 25 cm and height = 6 m

Volume of cuboid = (length × breadth × height) = (24 × 0.25 × 6) = 36 m^3

Lateral surface area of cuboid = 2(length + breadth) × height = 2(24 + 0.25) × 6 = 291 m^2

Total surface area of cuboid = 2(length × breadth + breadth × height + height × length)

= 2(24 × 0.25 + 0.25 × 6 + 6 × 24) = 303 m^2

Question: 2

Given,

Dimensions of closed rectangular cistern = 8m × 6m × 2.5 m

∴ Capacity of tank = volume of tank = (l × b × h) = 8 × 6 × 2.5 = 120 m^3

Area of iron sheet required to make the tank = 2(lb + bh + hl) = 2(8 × 6 + 6 × 2.5 + 2.5 × 8)=2(48 + 15 + 20)= 2 × 83 = 166m^2

Question: 3

Given,

Dimensions of room = 9m × 8m × 6.5m

Area of 4 walls = 2 (length + breadth) × height = 2 (9 + 8) × 6.5 = 13 × 17 = 221 m^2

Dimensions of one door = 2m × 1.5m

Area of door = length × breadth = 2 × 1.5 = 3.0 m^2

Dimensions of windows = 1.5m × 1m

Area of 2 windows = 2 (l × b) = 2 (1.5 × 1) = 3.0 m^2

Hence,

Area required for white-washing = Area of 4 walls – (area of door + area of 2 windows)

= 221 – (3 + 3) = 221 – 6 = 215 m^2

∵ cost of white-washing 1 m^2 area = Rs. 6.40

∴ cost of white-washing 215 m^2 = 6.40 × 215 = Rs. 1376.

Question: 4

Given,

Dimensions of plank;

l = 5m

b = 25cm = 0.25 m

h = 10cm = 0.10 m

Dimensions of pit;

l = 20m

b = 6m

h = 80m

$$number\ of\ planks = \frac{volume\ of\ pit}{volume\ of\ plank} = \frac{20 \times 6 \times 0.80}{5 \times 0.25 \times 0.10} = 768$$

Question: 5

Given,

Dimensions of wall = 8m × 6m × 22.5 cm = 800 cm × 600 cm × 22.5 cm

Dimensions of each brick = 25 cm × 11.25cm × 6 cm

Hence,

Number of bricks required = $\frac{volume\ of\ wall}{volume\ of\ one\ brick} = \frac{800 \times 600 \times 22.5}{25 \times 11.25 \times 6} = 6400\ bricks.$

Question: 6

Given,

Dimensions of wall = 15m × 30cm × 4m = 1500 cm × 30 cm × 400 cm

Dimensions of each brick = 22 cm × 12.5 cm × 7.5 cm

Volume of wall = l × b × h = 1500 × 30 × 400 = 180000000 cm^3

Area of mortar = 1/12 × volume of wall = $\frac{1}{12} \times 180000000 = 15000000\ cm^3$

Hence,

Area occupied by bricks only = 180000000 – 15000000 = 165000000 cm^3

Number of bricks required = $\frac{volume\ for\ bricks\ only}{volume\ of\ one\ brick} = \frac{165000000}{22 \times 12.5 \times 7.5} = 8000\ bricks.$

Question: 7

Given,

External Dimensions of cistern = 1.35m × 1.08m × 90cm = 135cm × 108cm × 90cm

External volume of cistern = l × b × h = 135 × 108 × 90 = 1312200 cm^3

Internal dimensions of cistern = length = 135 – (2.5 × 2) = 130 cm

Breadth = 108 – (2.5 × 2) = 103 cm

Height = 90 – 2.5 = 87.5 cm

∴ internal volume of cistern = 130 × 103 × 87.5 = 1171625 cm^3

Volumeof iron used = (External volume – Internal volume)

= 1312200 – 1171625 = 140575 cm^3

Question: 8

Given,

Depth of river (h) = 2 m

Breadth of river (b) = 45 m

Rate of flowing = 3 km/h

∴ Length = $\frac{3000}{60}$ meter/min.

Volume of water = l × b × h = $\frac{3000}{60} \times 2 \times 45 = 90 \times 50 = 4500\ m^3$

Question: 9

Given,

Total cost of box made of sheet metal = Rs. 1620

Cost of per square meter metal = Rs. 30

∴ Area of box = $\frac{1620}{30} = 54\ m^2$

Dimensions of box = 5m × 3m × height

Let height of box = h meter

Total surface area of sheet = 2 (lb + bh + hl)

= 54 = 2 (5 × 3 + 3h + 5h)

= $\frac{54}{2}$ = 15 + 8h

= 8h = 27 – 15 = 12

= h = $\frac{12}{8} = 1.5\ m$

Height of box = 1.5 meter.

Question: 10

Given,

Dimensions of room = 10m × 10m × 5m

∴ length of longest pole can be put in room = diagonal of room

= $\sqrt{l^2 + b^2 + h^2} = \sqrt{10^2 + 10^2 + 5^2} = \sqrt{225} = 15\ m$

Question: 11

Given,

Dimensions of dining hall = 20m × 16m × 4.5m

Volume of hall = 20 × 16 × 4.5 = 1440 m^3

Volume of air required by one person = 5 m^3

∴ Number of persons in hall = $\frac{volume\ of\ hall}{volume\ of\ air\ required\ by\ one\ person} = \frac{1440}{5} = 288\ persons.$

Question: 12

Given,

Dimensions of classroom = 10m × 6.4m × 5m

Area of room = length × breadth = 10 × 6.4 = 64 m^2

Area of floor required by one student = 1.6 m^2

∴ Number of students can sit in classroom = $\frac{Area\ of\ floor}{area\ required\ by\ one\ student} = \frac{64}{1.6} = 40\ students.$

Volume of classroom = 10 × 6.4 × 5 m^3

Air required by each student = $\frac{volume\ of\ room}{number\ of\ students} = \frac{10 \times 6.4 \times 5}{40} = 8\ m^3$

Question: 13

Given,

Volume of cuboid = 1536 m^3

Length of cuboid = 16 m

Ratio of breadth and height = 3 : 2

Let breadth = 3x

Let breadth = 2x

∴ Volume of cuboid = l × b × h

= 1536 = 16 × 3x × 2x

= $6x^2 = \frac{1536}{16} = 96$

= $x^2 = \frac{96}{6} = 16$

= x = $\sqrt{16}$ = 4

Hence,

Breadth of cuboid = 3x = 3 × 4 = 12m

Height of cuboid = 2x = 2 × 4 = 8m

Question: 14

Given,

Surface area of cuboid = 758 cm^2

Length of cuboid = 14 cm

Breadth of cuboid = 11 cm

Let height of cuboid = h cm

Total surface area of cuboid = 2 (lb + bh + hl)

= 758 = 2 (14 × 11 + 11h + 14h)

= 154 + 25h = $\frac{758}{2} = 379$

= 25h = 379 – 154 = 225

= h = $\frac{225}{25} = 9$

Height of cuboid = 9 meter.

Question: 15

Given,

a) Edge of cube (a) = 9m

Volume of cube = $a^3 = 9^3 = 729\ m^3$

Lateral surface area of cube = $4a^2 = 4 \times 9^2 = 4 \times 81 = 324\ m^2$

Total surface area of cube = $6a^2 = 6 \times 9^2 = 6 \times 81 = 486\ m^2$

Diagonal of cube = $\sqrt{3}\ a = \sqrt{3} \times 9 = 1.73 \times 9 = 15.57$ m

b) Edge of cube (a) = 6.5 cm

Volume of cube = $a^3 = 6.5^3 = 274.625\ cm^3$

Lateral surface area of cube = $4a^2 = 4 \times 6.5^2 = 4 \times 42.25 = 169\ cm^2$

Total surface area of cube = $6a^2 = 6 \times 6.5^2 = 6 \times 42.25 = 253.5\ cm^2$

Diagonal of cube = $\sqrt{3}\ a = \sqrt{3} \times 6.5 = 1.73 \times 6.5 = 11.245$ cm

Question: 16

Given,

Total surface area of cube = 1176 cm^2

Let edge of cube = a cm

$= 6\ a^2 = 1176$

$= a^2 = \frac{1176}{6} = 196$

$= a = \sqrt{196} = 14$ cm

$\therefore$ Volume of cube = $a^3 = 14^3 = 2744\ cm^3$

Question: 17

Given,

Lateral surface area of cube = 900 cm^2

Let edge of cube = a cm

$4a^2 = 900$

$= a^2 = \frac{900}{4} = 225$

$= a = \sqrt{225} = 15\ cm$

Volume of cube = $a^3 = 15^3 = 3375\ cm^3$

Question: 18

Given

Volume of cube = 512 cm^3

Let edge of cube = a cm

So,

$= a^3 = 512$

$= a = \sqrt[3]{512} = 8$ cm

Total surface area of cube = $6\ a^2 = 6 \times 8 \times 8 = 384\ cm^2$

Question: 19

Given,

Edge of three cubes $a_1 = 3$ cm , $a_2 = 4$ cm , $a_3 = 5$ cm

Let edge of single cube formed = A cm

Sum of volume of three cubes = volume of single cube formed

$= a_1^3 + a_2^3 + a_3^3 = A^3$

$= 3^3 + 4^3 + 5^3 = A^3$

$A^3 = 27 + 64 + 125 = 216$

$A = \sqrt[3]{216} = 6\ cm$

Lateral surface area of new cube = $4a^2 = 4 \times 6 \times 6 = 144\ cm^2$

Question: 20

Given,

Area of field = 2 hectare = 20000 m^2

Height of rainfall = 5 cm = 0.05 m

Volume of water that falls = Area × height

$= 20000 \times 0.05 = 1000\ m^3$

Exercise : 13B

Question: 1

Given,

Height of cylinder = 21 cm

Radius of base = 5 cm

∴ volume of right circular cylinder = $\pi r^2 h = \frac{22}{7} \times 5 \times 5 \times 21 = 1650\ cm^3$

Curved surface area = $2\pi rh = 2 \times \frac{22}{7} \times 5 \times 21 = 660\ cm^2$

Question: 2

Given,

Diameter of cylinder = 28 cm

Height of cylinder = 40 cm

Radius of cylinder = $\frac{diameter}{2} = \frac{28}{2} = 14\ cm$

∴ Curved surface area of cylinder = $2\pi rh = 2 \times \frac{22}{7} \times 14 \times 40 = 44 \times 40 \times 2 = 3520\ cm^2$

∴ total surface area of cylinder = $2\pi rh + 2\pi r^2 = 2\pi r(h + r) = 2 \times \frac{22}{7} \times 14 \times 54 = 88 \times 54 = 4752$ cm^2

∴ Volume of cylinder = $\pi r^2 h = \frac{22}{7} \times 14 \times 14 \times 40 = 24640\ cm^3$

Question: 3

Given,

Radius of cylinder = 10.5 cm

Height of cylinder = 60 cm

∴ Volume of cylinder = $\pi r^2 h = \frac{22}{7} \times 10.5 \times 10.5 \times 60 = 20790\ cm^3$

∴ Weight of cylinder = volume of cylinder × wt. of cylinder per gram

$= 20790 \times 5$ g = 103950 g = 103.95 kg

Question: 4

Given,

Curved surface area of cylinder = 1210 cm^2

Diameter of cylinder = 20 cm

Radius of cylinder = $\frac{20}{2}$ = 10 cm

Let height of cylinder = h cm

Curved surface area = 2πrh

= 2πrh = 1210

$= 2 \times \frac{22}{7} \times 10 \times h = 1210$

$= h = \frac{1210 \times 7}{44 \times 10} = 19.25$ cm

∴ Volume of cylinder = $\pi r^2 h = \frac{22}{7} \times 10 \times 10 \times 19.25 = 6050$ cm^3

Question: 5

Given,

Curved surface area of cylinder = 4400 cm^2

Circumference of its base = 110 cm

2πr = 110

$= r = \frac{110}{2\pi} = \frac{110 \times 7}{44} = \frac{35}{2} cm$

Let height of cylinder = h cm

C.S.A = 4400

2πrh = 4400

$= 2 \times \frac{22}{7} \times \frac{35}{2} \times h = 4400$

$= h = \frac{4400 \times 7 \times 2}{44 \times 35} = 40\ cm$

∴ Volume of cylinder = $\pi r^2 h = \frac{22}{7} \times \frac{35}{2} \times \frac{35}{2} \times 40 = 110 \times 350 = 38500\ cm^3$

Question: 6

Given,

Volume of cylinder = 1617 cm^3

Ratio of radius of base and height = 2 : 3

Let base radius = 2x cm

Let height = 3x cm

Volume = $\pi r^2 h$

$= \frac{22}{7} \times 4x^2 \times 3x = 1617$

$= x^3 = \frac{1617 \times 7}{22 \times 12}$

$= x^3 = 42.875$

$= x = \sqrt[3]{42.875} = 3.5\ cm$

Hence,

Radius of cylinder = 2 × 3.5 = 7 cm

Height of cylinder = 3 × 3.5 = 10.5 cm

Total surface area of cylinder = $2\pi rh + 2\pi r^2 = 2\pi r(h + r) = 2 \times \frac{22}{7} \times 7 \times 17.5 = 770\ cm^2$

Question: 7

Given,

Total surface area of cylinder = $462\ cm^2$

$2\pi r(h + r) = 462$

$\Rightarrow r(h + r) = \frac{462}{2\pi}$

$\Rightarrow r^2 + rh = \frac{(462 \times 7)}{44} = \frac{(21 \times 7)}{2} \ldots\ldots\ldots\ldots\ldots\ldots\ldots (i)$

CSA = $\frac{1}{3}\, TSA\ (given)$

$2\pi rh = \frac{1}{3} \times 462 = 154$

$\Rightarrow rh = \frac{154}{2\pi} = \frac{(154 \times 7)}{44} = \frac{49}{2} \ldots\ldots\ldots\ldots\ldots. (ii)$

Putting value of rh in equation (i)

$\Rightarrow r^2 + \frac{49}{2} = \frac{147}{2}$

$\Rightarrow r^2 = \frac{147}{2} - \frac{49}{2} = \frac{98}{2} = 49$

$\Rightarrow r = \sqrt{49} = 7\ cm$

From (ii)

$\Rightarrow rh = \frac{49}{2}$

$\Rightarrow h = \frac{49}{2 \times 7} = \frac{7}{2} cm$

$\therefore$ Volume of cylinder = $\pi r^2 h = \frac{22}{7} \times 7 \times 7 \times \frac{7}{2} = 532\ cm^3$

Question: 8

Given,

Total surface area of solid = $231\ cm^2$

$2\pi r(h + r) = 231$

$\Rightarrow r(r + h) = \frac{(231 \times 7)}{44}$

$\Rightarrow r^2 + rh = \frac{231 \times 7}{44} \ldots\ldots\ldots\ldots\ldots\ldots\ldots (i)$

CSA = $\frac{2}{3} TSA\ given$

$2\pi rh = \frac{2}{3} \times 231$

$\Rightarrow rh = \frac{2 \times 231 \times 7}{2 \times 3 \times 22} = \frac{49}{2} \ldots\ldots\ldots\ldots\ldots\ldots\ldots (ii)$

Putting value of rh in (i) we get,

$\Rightarrow r^2 + \frac{49}{2} = \frac{231 \times 7}{44}$

$\Rightarrow r^2 = \frac{1617}{44} - \frac{49}{2} = \frac{1617 - 1078}{44} = \frac{539}{44} = 12.25$

$\Rightarrow$ r = $\sqrt{12.25} = 3.5\ cm$

From equation (ii)

$\Rightarrow$ rh = $\frac{49}{2}$

$\Rightarrow$ h = $\left(\frac{49}{3.5 \times 2}\right) = 7\ cm$

$\therefore$ Volume of cylinder = $\pi r^2 h = \frac{22}{7} \times 3.5 \times 3.5 \times 7 = 269.5\ cm^3$

Question: 9

Given,

Total surface area of cylinder = 1628 m^2

Sum of height and radius = (h + r) = 37 m

$2\pi r\ (h + r) = 1628$

$2\pi r \times 37 = 1628$

$\Rightarrow$ r = $\frac{1628 \times 7}{2 \times 22 \times 37} = 7\ m$

$\because$ r + h = 37

$\Rightarrow$ h = 37 – 7 = 30 m

$\therefore$ Volume of cylinder = $\pi r^2 h = \frac{22}{7} \times 7 \times 7 \times 30 = 4620\ m^3$

Question: 10

Given,

Total surface area of cylinder = 616 cm^2

$\Rightarrow \frac{C.S.A}{T.S.A} = \frac{1}{2}$

$\Rightarrow \frac{2\pi rh}{\{2\pi r(h+r)\}} = \frac{1}{2}$

$\Rightarrow \frac{h}{h+r} = \frac{1}{2}$

$\Rightarrow$ 2h = r + h

$\Rightarrow$ h = r……………………….(i)

$2\pi r\ (h + r) = 616$

$\Rightarrow$ r (r + r) = $\frac{616 \times 7}{44} = 198$

$\Rightarrow r^2 = \frac{198}{2} = 49$

$\Rightarrow$ r = $\sqrt{49} = 7\ cm$

H = 7 cm

$\therefore$ Volume of cylinder = $\pi r^2 h = \frac{22}{7} \times 7 \times 7 \times 7 = 22 \times 49 = 1078\ cm^3$

Question: 11

Given,

Diameter of wire = 0.1 mm = 0.01 cm

Radius of wire = $\frac{0.01}{2}\ cm$

Volume of gold = 1 cm^3

$\Rightarrow \pi r^2 h = 1$

$\Rightarrow \frac{22}{7} \times \left(\frac{0.01}{2}\right)^2 \times h = 1$

$\Rightarrow h = \frac{200 \times 200 \times 7}{22 \times 1 \times 1} = 12727.27$ cm or 127.27 m

Length of wire = 127.27 meter.

Question: 12

Given,

Ratio of radii of two cylinders = $R_1 : R_2 = 2 : 3$

Ratio of their heights = $H_1 : H_2 = 5 : 3$

$\therefore$ Ratio of volumes of cylinders = $\frac{V_1}{V_2} = \frac{\pi R_1^2 H_1}{\pi R_2^2 H_2} = \frac{4 \times 5}{9 \times 3} = \frac{20}{27}\ OR\ 20 : 27.$

$\therefore$ Ratio of their curved surface area = $\frac{A_1}{A_2} = \frac{2\pi R_1 H_1}{2\pi R_2 H_2} = \frac{2 \times 5}{3 \times 3} = \frac{10}{9}\ or\ 10 : 9.$

Question: 13

Given,

Side of square base = 12 cm

Height = 17.5 cm

Volume of tin = lbh = 12 × 12 × 17.5 = 2520 cm^3

Diameter of cylindrical base = 12 cm

Radius = $\frac{12}{2} = 6\ cm$

Height of cylinder = 17.5 cm

Volume of tin in cylinder = $\pi r^2 h = \frac{22}{7} \times 6 \times 6 \times 17.5 = \frac{13860}{7} = 1980\ cm^3$

Hence,

Capacity of square tin is more by = 2520 – 1980 = 540 cm^3

Question: 14

Given,

Diameter of cylindrical bucket = 28 cm

Radius of bucket = $\frac{28}{2} = 14\ cm$

Height of bucket = 72 cm

Volume of water in bucket = $\pi r^2 h = \frac{22}{7} \times 14 \times 14 \times 72\ cm^3$

Length of rectangular tank = 66 cm

Width of tank = 28 cm

Let rise in water level in rectangular tank = h cm

$\because$ Volume of cylinder = Volume of rectangular tank

$\Rightarrow \frac{22}{7} \times 14 \times 14 \times 72 = 66 \times 28 \times h$

$\Rightarrow h = \frac{22 \times 14 \times 14 \times 72}{7 \times 66 \times 28} = 24\ cm.$

Question: 15

Given,

Weight of 1 cm^3 cast iron = 21 g

Length of wire = h = 1 m = 100 cm

Internal radius (r_1) = $\frac{3}{2} = 1.5\ cm$

Thickness of metal = 1 cm

So, External radius (r_2) = 1.5 + 1 = 2.5 cm

Volume of metal = (External volume – internal volume)

$= \pi r_2^2 h - \pi r_1^2 h = \pi h\ (r_2^2 - r_1^2) = \frac{22}{7} \times 100\ (2.5 + 1.5)\ (2.5 - 1.5)$

$= \frac{22}{7} \times 100 \times 4 \times 1\ cm^3$

Weight of metal = $\frac{22}{7} \times 100 \times 4 \times 1 \times 21 = 26400\ gm = 26.4\ kg.$

Question: 16

Given,

Internal diameter of tube = 10.4 cm

Internal radius of tube = $\frac{10.4}{2} = 5.2\ cm$

Thickness of metal = 8 mm = 0.8 cm

External radius of tube = 5.2 + 0.8 = 6 cm

Length of tube = 25 cm

∴ Volume of metal = (external volume – internal volume)

$= \pi h\ (6^2 - 5.2^2) = \frac{22}{7} \times 25 \times 11.2 \times 0.8 = 22 \times 32 = 704\ cm^3$

Question: 17

Given,

Length of cylindrical barrel (h) = 7 cm

Diameter = 5 mm

Radius = $\frac{5}{2} = 2.5\ mm = 0.25\ cm$

Volume of cylindrical barrel = $\pi r^2 h = \frac{22}{7} \times 0.25 \times 0.25 \times 7 = \frac{5.5}{4} cm^3$

∵ $\frac{5.5}{4}$ cm^3 volume of barrel is used for writing = 330 words

∴ $\frac{5.5}{4} \times 1000\ cm^3$ will be used for writing = $330 \times \frac{4}{5.5} \times \frac{1}{8} \times 1000 = 48000\ words$

Question: 18

Given,

Diameter of pencil = 7 mm

Radius of pencil = $\frac{7}{2}\ mm = \frac{0.7}{2} cm$

Diameter of graphite = 1 mm

Radius of graphite = $\frac{1}{2} mm = \frac{0.1}{2}\ cm$

Volume of graphite = $\pi r^2 h = \frac{22}{7} \times \frac{0.1}{2} \times \frac{0.1}{2} \times 10 = \frac{0.55}{7} cm^3$

Weight of graphite = volume × specific gravity of graphite

$= \frac{0.55}{7} \times 2.1 = 0.165\ g$

Volume of wood = volume of pencil – volume of graphite

$= \frac{22}{7} \times ((0.35)^2 - (0.05)^2) \times 10 \times 0.7$

$= \frac{22}{7} \times (0.1225 - 0.0025) \times 7 = 2.64\ g$

∴ Total weight of the pencil = weight of wood + weight of graphite

= 0.165 + 2.64 = 2.805 g.

Exercise : 13C

Question: 1

Given,

Radius of the cone = 35cm

Height of the cone = 84cm

Curved surface area = πrl

So, we need to find out the l;

l = slant height

$l = \sqrt{h^2 + r^2}$

$l = \sqrt{84^2 + 35^2} = \sqrt{7056 + 1225} = \sqrt{8281}$

l = 91cm

Curved surface area $= \frac{22}{7} \times 35 \times 91$

= 110 × 91 = 10010cm^2

Volume of the cone $= \frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \frac{22}{7} \times 35 \times 35 \times 84$

= 88 × 1225

= 107800cm^2

Total surface area = πrl + πr^2

$= 10010 + \frac{22}{7} \times 35 \times 35$

= 10010 + 3850 = 13860

Total surface area = 13860cm^2

Question: 2

Given,

Height (h) = 6cm

Slant height (l) = 10cm

r = $\sqrt{l^2 - h^2}$

$r = \sqrt{(10)^2 - (6)^2}$

r = $\sqrt{100 - 36} = \sqrt{64}$

r = 8cm

Volume of the cone = $\frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \frac{22}{7} \times 8 \times 8 \times 6$

$= \frac{8448}{21}$ = 401.92cm^2

Curved surface area = πrl

Curved surface area = $\frac{22}{7} \times 8 \times 10$

$= \frac{1760}{7}$ = 251.2cm^2

Total surface area = πr(r + l)

$= \frac{22}{7} \times 8 \times (8 + 10)$

$= \frac{22}{7} \times 8 \times 18$

$= \frac{3168}{7}$ = 452.16 cm^2

Question: 3

Given,

h = 12 cm

Volume of the cone = 100π cm^3

$= \frac{1}{3}\pi r^2 h = 100\pi$

$r^2h = 100 \times 3$

$r^2 \times 12 = 100 \times 3$

$r^2 = \frac{100 \times 3}{12} = 25$

r = 5cm

$l = \sqrt{h^2 + r^2}$

$= \sqrt{(12)^2 + (5)^2}$

$= \sqrt{144 + 25}$

$= \sqrt{169} = 13$

Curved surface area = πrl

= π × 5 × 13

= (65π) cm^2

Question: 4

Given,

Circumference of the base of the cone = 44cm

2πr = 44cm

$r = \frac{44 \times 7}{2 \times 22} = 7$

r = 7cm

$h = \sqrt{l^2 - r^2}$

$= \sqrt{(25)^2 - (7)^2}$

$= \sqrt{625 - 49}$

$= \sqrt{576} = 24$

$volume = \frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \frac{22}{7} \times 7 \times 7 \times 24$

= 22 × 56 = 1232

Volume = 1232 cm^3

Curved surface area = πrl

$= \frac{22}{7} \times 7 \times 25$

= 550 cm^2

Question: 5

Given,

Curved surface area = 550cm^2

πrl = 550

$\frac{22}{7} \times r \times 25 = 550$

$r = \frac{550 \times 7}{22 \times 25}$

r = 7cm

$h = \sqrt{l^2 - h^2} = \sqrt{25^2 - 7^2}$

$= \sqrt{625 - 49} = \sqrt{576} = 24$

h = 24cm

Volume = $\frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \frac{22}{7} \times 7 \times 7 \times 24$

= 24 × 56

Volume = 1232cm^3

Question: 6

Given,

r = 35cm

l = 37cm

Volume of the cone = $\frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \frac{22}{7} \times 38 \times 35 \times h$

$= \frac{3850}{3} h$

$h = \sqrt{l^2 - h^2} = \sqrt{37^2 - 35^2}$

$= \sqrt{1369 - 1225}$

$= \sqrt{144} = 12$

$volume = \frac{3850}{3} \times 12$

Volume = 1540 cm^3

Question: 7

Given,

$r = \frac{70}{2} = 35cm$

Curved surface area = 4070

πrl = 4070

$l = \frac{4070}{\pi r}$

$= \frac{4070 \times 7}{22 \times 35}$

$= \frac{814}{22}$ = 37cm

Question: 8

Given,

Radius = 7cm

h = 24cm

Curved surface area of the conical tent = πrl

$l = \sqrt{h^2 + r^2}$

$= \sqrt{(24)^2 + (7)^2}$

$= \sqrt{576 + 49}$

$= \sqrt{625}$

= 25m

Curved surface area of the tent = πrl

$= \frac{22}{7} \times 7 \times 25$

= 550 m^2

Length of cloth = $\frac{area}{width}$

$= \frac{550}{2.5} = 220m$

Question: 9

When we melt any shape, and recast into another shape than volume of both shapes remain same.

Radius of the circular cone (r_1) = 1.6cm

Height of the circular cone (h_1) = 3.6cm

Radius of the new circular cone (r_2) = 1.2 cm

Let height of the new circular cone be h_2

Volume of the circular cone = volume of the new circular cone

$$\frac{1}{3}\pi r_1^2 h = \frac{1}{3}\pi r_2^2 h$$

$(1.6)^2 \times (3.6) = (1.2)^2 \times h_2$

$$h_2 = \frac{(1.6)^2 \times 3.6}{(1.2)^2} = \frac{1.6 \times 1.6 \times 3.6}{1.2 \times 1.2} = 64$$

h_2 = 64 cm

So, the height of the new circular cone will be 64cm

Question: 10

Given,

Ratio of the heights = $h_1 : h_2$ = 1:3

Let the heights of the cones be x and 3x,

Ratio of radius of base of the two cones = $r_1:r_2$ = 3:1

So,

Let the radius be 3x and x for the cones and volume will be v_1 and v_2

$$\frac{v_1}{v_2} = \frac{\frac{1}{3}\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2}$$

$$= \frac{(3x)^2 \times x}{x^2 \times 3x}$$

$$= \frac{9x^2}{3x^2}$$

$$\frac{v_1}{v_2} = \frac{3}{1}$$

So, ratio of the volume of the two cones will be 3:1

Question: 11

$\frac{105}{2}$

Height of the conical portion = 53m

Area of canvas = curved surface area of conical part + curved surface area of cylindrical part

= πrl + 2πrh

$$= \frac{22}{7} \times \frac{105}{2} \times 53 + 2 \times \frac{22}{7} \times \frac{105}{2} \times 3$$

= 8745 + 990

= 9735m^2

Length of canvas = area/width

$$= \frac{9735}{5} = 1947m$$

Hence the length of the canvas will be 1947m

Question: 12

$$r^2 = 44 \times \frac{7}{22} = 14$$

Volume of the cone = 220m^3

We know that,

Volume of the cone = $\frac{1}{3}\pi r^2 h$

$$\frac{1}{3}\pi r^2 h = 220$$

$$\frac{1}{3} \times \frac{22}{7} \times 14 \times h = 220$$

$$h = \frac{220 \times 3 \times 7}{22 \times 14} = 15m$$

Hence, the height of the cone will be 15m

Question: 13

$\frac{1}{3}\pi r^2 h$

$$r^2 = \frac{18 \times 18 \times 32 \times 3}{24}$$

$r^2 = 18 \times 8 \times 4$

r = 18 × 2

r = 36cm

slant height l = $\sqrt{h^2 + r^2}$

$= \sqrt{(24)^2 + (36)^2}$

$= \sqrt{576 + 1296}$

$= \sqrt{1872}$

l = 43.27cm

Question: 14

$$\frac{CSA\ of\ cylinder}{CSA\ of\ cone} = \frac{8x}{5x}$$

$$\frac{2\pi rh}{\pi rl} = \frac{8}{5}$$

$$\frac{2h}{\sqrt{h^2 + r^2}} = \frac{8}{5}$$

$$\left(\frac{2h}{\sqrt{h^2 + r^2}}\right)^2 = \left(\frac{8}{5}\right)^2$$

$$\frac{4h^2}{h^2 + r^2} = \frac{64}{25}$$

$100h^2 = 64h^2 + 64r^2$

$100h^2 - 64h^2 = 64r^2$

$36h^2 = 64r^2$

$$\frac{r^2}{h^2} = \frac{36}{64}$$

$$\frac{r}{h} = \frac{6}{8}$$

$$\frac{r}{h} = \frac{3}{4}$$

Question: 15

$$\frac{20}{2} = 10cm$$

Height of cone = 42cm

Volume of pillar = volume of cone + volume of cylinder

$= \frac{1}{3}\pi r^2 h + \pi r^2 h$

$= \frac{1}{3} \times \frac{22}{7} \times 10 \times 10 \times 42 + \frac{22}{7} \times 10 \times 10 \times 280$

$= \frac{22}{7} \times 100[14 + 280]$

$= \frac{22}{7} \times 100 \times 294$

$= \frac{646800}{7} = 92400$

Given that,

Weight of 1 cm^3 iron = 7.5gm

Weight of the pillar = 92400 × 75

Weight of the pillar = 693000g

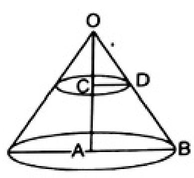
= 693kg

Question: 16

Let’s suppose the smaller cone have the radius r and height h cm

And radius of the given cone be R cm

Height of the original cone = 30cm



In triangle ΔOAB and ΔOCD

∠COD = ∠AOB (common angle)

∠OCD = ∠OAB (90°)

∴ Δ OAB ~ ΔOCD [by A-A criteria]

Then,

$\frac{r}{R} = \frac{h}{30}$

$r = \frac{Rh}{30}$...........(i)

Volume of small cone = $\frac{1}{27}$ volume of original cone

$\frac{1}{3}\pi r^2 h = \frac{1}{27} \times \frac{1}{3}\pi R^2 \times 30$

From equation (i)

$\left(\frac{Rh}{30}\right)^2 h = \frac{1}{27} \times R^2 \times 30$

$\frac{R^2 h^2}{30 \times 30} = \frac{1}{27} \times R^2 \times 30$

$h^3 = \frac{1}{27} \times 30 \times 30 \times 30$

$h^3 = 1000$

h = 10cm

Height of the small cone = 10cm

AC = OA-OC

AC = 30-10 = 20

Hence selection has been made at height of 20cm above the base.

Question: 17

$= \pi r^2 h - \frac{1}{3}\pi r^2 h$

$= \frac{2}{3}\pi r^2 h$

$= \frac{2}{3} \times 3.14 \times 6 \times 6 \times 10$

Volume of remaining solid = 753.6cm^3

Question: 18

$\frac{5}{2}$ = 2.5mm

= 0.25cm [as we know 10mm = 1cm]

Water flowing per minute through cylindrical pipe = $\pi(0.25)^2 \times 1000$

Radius of the conical vessel = $\frac{40}{2} = 20cm$

Depth of the vessel = 24cm

Volume of the vessel = $\frac{1}{3}\pi(20)^2 \times 24$

Let the time to fill the conical vessel be x minute,

Water flowing per minute through cylindrical pipe x x = volume of conical vessel

x = $\frac{\frac{1}{3}\pi(20)^2 \times 24}{\pi(0.25)^2 \times 1000}$

x = $\frac{20 \times 20 \times 8}{0.25 \times 0.25 \times 1000}$

x = 51min 12 sec.

Hence the required time to fill a conical vessel is 51min 12 sec

Exercise : 13D

Question: 1

(i) Radius of sphere = 3.5cm

Volume = $\frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \frac{22}{7} \times 3.5 \times 3.5 \times 3.5$

= 179.67cm^3

Surface area = $4\pi r^2$

$= 4 \times \frac{22}{7} \times 3.5 \times 3.5$

= 2 × 22 × 3.5 = 154 cm^2

(ii) R = 4.2cm

Volume = $\frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \frac{22}{7} \times 4.2 \times 4.2 \times 4.2$

= 310.464cm^2

Surface area = $4\pi r^2$

$= 4 \times \frac{22}{7} \times 4.2 \times 4.2$

$= 4 \times 22 \times .6 \times 4.2$

$= 221.76cm^2$

(iii) R = 5cm

Volume $= \frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \frac{22}{7} \times 5 \times 5 \times 5$

$= \frac{11000}{21} = 523.80cm^3$

Surface area = $4\pi r^2$

$= 4 \times \frac{22}{7} \times 5 \times 5$

$= \frac{20 \times 110}{7} = 314.28cm^2$ +

Question: 2

Volume of sphere = $38808cm^3$

$\frac{4}{3}\pi r^3 = 38808$

$r^3 = \frac{38808 \times 3}{4\pi}$

$r^3 = \frac{38808 \times 3 \times 7}{4 \times 22}$

$r^3 = 441 \times 21$

$r^3 = 21 \times 21 \times 21$

r = 21cm

surface area = $4\pi r^2$

$= 4 \times \frac{22}{7} \times 21 \times 21$

$= 5544cm^3$

Question: 3

Given,

Volume = $606.375cm^3$

$\frac{4}{3}\pi r^3 = 606.375$

$r^3 = \frac{606.375 \times 3}{4\pi}$

$r^3 = \frac{606.375 \times 3 \times 7}{4 \times 21}$

$r^3 = \frac{12733.875}{88}$

$r^3 = 144.703$

r = 5.25m

Surface area = $4\pi r^2$

$= 4 \times \frac{22}{7} \times 5.25 \times 5.25$

$= 346.5m^2$

Question: 4

Given,

Surface area = $394.24m^2$

$4\pi r^2 = 394.24$

$4 \times \frac{22}{7} \times r^2 = 394.24$

$r^2 = \frac{394.24 \times 7}{22 \times 4}$

$r^2 = \frac{2759.68}{88}$

$r^2 = 31.36$

r = 5.67cm

Volume $= \frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \frac{22}{7} \times 5.6 \times 5.6 \times 5.6$

$= \frac{4}{3} \times 22 \times 0.8 \times 5.6 \times 5.6$

$= 735.91cm^3$

Question: 5

Given,

Surface area = 576π

$4\pi r^2 = 576\pi$

$r^2 = \frac{576\pi}{4\pi} = 144$

r = 12cm

Volume $= \frac{4}{3}\pi r^3$

$= \frac{4}{3}\pi \times 12 \times 12 \times 12$

$= 2304cm^3$

Question: 6

Given,

Outer Diameter of spherical shell = 12cm

Radius of the outer sphere r_1 = 6cm

Inner diameter of spherical shell = 8cm

Radius of the inner sphere r_2 = 4cm

Volume of metal = outer volume – inner volume

$= \frac{4}{3}\pi r_1^3 - \frac{4}{3}\pi r_2^3$

$= \frac{4}{3}\pi[r_1^3 - r_2^3]$

$= \frac{4}{3} \times \frac{22}{7} \times [6^2 - 4^3]$

$= \frac{4}{3} \times \frac{22}{7}[216 - 64]$

$= \frac{4}{3} \times \frac{22}{7} \times 152$

= 636.95cm^3

Surface area of outer surface = 4πr^2

$= 4 \times \frac{22}{7} \times 6 \times 6$

= 452.571cm^2

Question: 7

Given,

Dimensions of cuboid l = 12cm

b = 11cm

h = 9cm

Diameter of sphere (d) = 3mm

r = $\frac{3}{2} mm$ = 1.5mm

r = 0.15 cm

When we melt any object, and convert it into another then the volume of both the object will be same.

So,

Volume of cuboid = n × volume of sphere

n = no. of sphere

l × b × h = $n \times \frac{4}{3}\pi r^3$

12 × 11 × 9 = $n \times \frac{4}{3} \times \frac{22}{7} \times 0.15 \times 0.15 \times 0.15$

n = $\frac{12 \times 11 \times 9 \times 3 \times 7 \times 100 \times 100 \times 100}{4 \times 22 \times 0.15 \times 0.15 \times 0.15} = \frac{3 \times 7 \times 20 \times 20 \times 20}{2}$

n = 84000

Question: 8

Given,

Radius of big sphere (R) = 8cm

Radius of small sphere (r) = 1cm

Volume of big sphere = 2 × volume of small sphere

n = no. of sphere

$\frac{4}{3}\pi R^3 = n \times \frac{4}{3}\pi r^3$

$\frac{4}{3}\pi (8)^3 = n \times \frac{4}{3}\pi (1)^3$

512 = n

n = 512 ball

Question: 9

Given,

Radius of big ball = 3cm

Diameter of small ball = 0.16cm

$r = \frac{0.16}{2} = 0.3cm$

Volume of big ball = n × volume of small ball

$\frac{4}{3}\pi(3)^3 = n \times \frac{4}{3}\pi(0.3)^3$

$n = \frac{(3)^3}{(0.3)^3} = \frac{3 \times 3 \times 3}{0.3 \times 0.3 \times 0.3} = \frac{3 \times 3 \times 3}{3 \times 3 \times 3} \times 1000$

n = 1000

Question: 10

Given,

Sphere radius = 10.5cm

Cone radius = 3.5cm

h = 3cm

When any object is melt and recast into another so the volume of both the object will be same

Volume of sphere = n × volume of cone

$\frac{4}{3} \times \pi r^3 = n \times \frac{1}{3}\pi r^3 h$

$\frac{4}{3}\pi \times 10.5 \times 10.5 \times 10.5 = n \times \frac{1}{3} \times \pi \times 3.5 \times 3.5 \times 3$

$n = \frac{4\pi \times 10.5 \times 10.5 \times 10.5 \times 3}{3\pi \times 3.5 \times 3.5 \times 3}$

n = 126

Question: 11

Given,

Diameter of cylinder = 8cm

Radius = 4cm

Height = 90cm

Diameter of sphere = 12cm

Radius = 6cm

When we convert any object into another shape the volume will remain same.

Volume of cylinder = n × volume of sphere

$\pi r^2 h = n \times \frac{4}{3}\pi r^3$

$\pi \times 4 \times 4 \times 90 = n \times \frac{4}{3}\pi(6)^3$

$n = \frac{\pi \times 4 \times 4 \times 90 \times 3}{4\pi \times (6)^3}$

$n = \frac{4 \times 90 \times 3}{6 \times 6 \times 6} = \frac{90}{18}$

n = 5

Question: 12

Given,

Diameter sphere = 6cm

r = 3cm

radius of wire $= \frac{2}{2} = 1mm$

r = 0.1cm

let us consider length of wire = h cm

When we convert any object into another shape the volume will remain same.

Volume of sphere = volume of cylinder

$\frac{4}{3}\pi r^3 = \pi r^2 h$

$\frac{4}{3}\pi(3)^3 = \pi(1)^2 h$

$h = \frac{4\pi \times 3 \times 3 \times 3}{3 \times 0.1 \times 0.1 \times \pi} = \frac{4 \times 3 \times 3}{.001}$

h = 36 × 100 =3600

h = 36m

Question: 13

Given,

Radius of sphere = 9cm

Let us consider diameter at cylinder = d cm

Radius = r cm

Height = 108 m = 10800 cm

When we convert any object into another shape the volume will remain same.

Volume of sphere = volume of cylinder

$\frac{4}{3}\pi r^3 = \pi r^2 h$

$\frac{4}{3}\pi(9)^3 = \pi r^2 \times 10800$

$r^2 = \frac{4 \times 9 \times 9 \times 9}{3 \times 10800}$

$r^2 = \frac{4}{3} \times \frac{729}{10800}$

$r^2 = 0.09$

r = 0.03 cm

Diameter = 2 × 0.03 = 0.06 cm

Question: 14

Given,

When we convert any object into another shape the volume will remain same.

Radius of sphere = $\frac{15.6}{2} = 7.8cm$

Radius of cone = r cm

Volume of sphere = volume of cone

$\frac{4}{3}\pi r^3 = \frac{1}{3}\pi r^2 h$

$\frac{4}{3}\pi(7.8)^3 = \frac{1}{3}\pi r^2 \times 31.2$

$r^2 = \frac{4\pi \times 3 \times 7.8 \times 7.8 \times 7.8}{3\pi \times 31.2} = \frac{4 \times 474.552}{31.2}$

$r^2 = \frac{1898.208}{31.2}$

$r^2 = 60.84$

r = 7.8cm

d = 2 × r = 2 × 7.8 =15.6 cm

Question: 15

Given,

Radius of sphere (r_3) = 14cm

Diameter of cone = 35cm

$r_c = \frac{35}{2}$

When we convert any object into another shape the volume will remain same.

Volume of sphere = volume of cone

$\frac{4}{3}\pi r_3^3 = \frac{1}{3}\pi r_c^2 h$

$4r_3^3 = r_c^2$

$4 \times (14)^3 = \left(\frac{35}{2}\right)^2 \times h$

$h = \frac{4 \times 14 \times 14 \times 14}{\left(\frac{35}{2}\right)^2}$

$h = \frac{4 \times 14 \times 14 \times 14 \times 2 \times 2}{35 \times 35} = 35.84cm$

Question: 16

Given,

Radius of big ball (R) = 3cm

Radius of smaller ball (r_1) = 1.5 cm

Radius of second smaller ball (r_2) = 2 cm

Let r_3 be the radius of 3^{rd} smaller ball

V = $v_1 + v_2 + v_3$

$\frac{4}{3}\pi(R)^3 = \frac{4}{3}\pi r_1^3 + \frac{4}{3}\pi r_2^3 + \frac{4}{3}\pi r_3^3$

$(R)^3 = r_1^3 + r_2^3 + r_3^3$

$(3)^3 = (1.5)^3 + (2)^3 + (r_3)^3$

$27 = 2.817 + 8 + (r_3)^3$

$(r_3)^3 = 27- (2.817 + 8) = 16.875$

$r_3 = 2.5$ cm

Question: 17

Given,

Ratio of radii of spheres = $R_1 : R_2 = 1 : 2$

Ratio of their surface areas = $\frac{A_1}{A_2} = \frac{4\pi R_1^2}{4\pi R_2^2} = \frac{R_1^2}{R_2^2} = \left(\frac{1}{2}\right)^2 = \frac{1}{4}$.

Question: 18

Given,

Ratio of Surface area of two spheres = $A_1: A_2 = 1 : 4$

Let radius of these sphere are resp. = R_1 and R_2

$= \frac{A_1}{A_2} = \frac{1}{4}$

$= \frac{4\pi R_1^2}{4\pi R_2^2} = \frac{1}{4}$

$= \frac{R_1^2}{R_2^2} = \frac{1}{4}$

$= \frac{R_1}{R_2} = \sqrt{\frac{1}{4}} = \frac{1}{2}$

Ratio of their volumes $= \frac{\frac{4}{3}\pi R_1^3}{\frac{4}{3}\pi R_2^3} = \frac{R_1^3}{R_2^3} = \left(\frac{1}{2}\right)^3 = \frac{1}{8}$.

Question: 19

Given,

Radius of cylinder = 12 cm

Height = 20 cm

Before drop a ball volume of water $= v_1 = \pi r^2 h = \pi r^2 \times 20\ cm^3$

After droping rise in water level = 6.75 cm

New height = 20 + 6.75 = 26.75 cm

New volume $= \pi r^2 \times 26.75\ cm^3$

Volume of spherical ball $= \pi r^2\ (26.75 - 20)$

$= \pi r^2 \times 6.75 = \frac{22}{7} \times 12 \times 12 \times 6.75 = 3054.85\ cm^3$

$= \frac{4}{3}\pi R^3 = 3054.85$

$= R^3 = \frac{3054.85 \times 3 \times 7}{4 \times 22} = 729$

$= R = \sqrt[3]{729} = 9\ cm$

Question: 20

Given,

Radius of spherical ball = 9 cm

Volume of spherical ball $= \frac{4}{3}\pi r^3 = \frac{4}{3}\pi(9)^3\ cm^3$

Radius of cylinder = 15 cm

Let the increase in level = h cm

$= \frac{4}{3}\pi \times 729 = \pi \times 15 \times 15 \times h$

$= h = \frac{4}{3} \times \frac{729}{225} = 4.326\ cm$

Question: 21

Given,

Radius of hemisphere = (R) = 9 cm

Height of cone = 72 cm

Let radius of cone = r cm

We know that,

Volume of hemisphere = volume of cone

$= \frac{2}{3}\pi R^3 = \frac{1}{3}\pi r^2 h$

$= \frac{2}{3} \times 9^3 = r^2 \times 72$

$= r^2 = \frac{2 \times 729}{3 \times 72} = \frac{81}{4}$

$= r = \sqrt{\frac{81}{4}} = \frac{9}{2} = 4.5\ cm$

Radius of base of cone = 4.5 cm.

Question: 22

Given,

Radius of hemisphere (R) = 9 cm

Radius of cylinder (r) = $\frac{3}{2} = 1.5\ cm$

Height of cylinder = 4 cm

Volume of hemisphere = n × volume of cylinder

$= \frac{2}{3}\pi R^3 = n \times \pi r^2 h$

$= \frac{2}{3} \times 9^3 = n \times 1.5^2 \times 4$

$= n = \frac{2 \times 9 \times 9 \times 9}{3 \times 1.5 \times 1.5 \times 4} = 54$.

Question: 23

Given,

Internal radius of sphere (r_i) = 8 cm

External radius of sphere (r_e) = 9 cm

Volume of shell = (external volume – internal volume)

$= \frac{4}{3}\pi r_e^3 - \frac{4}{3}\pi r_i^3 = \frac{4}{3}\pi(9^3 - 8^3) = \frac{4}{3} \times \frac{22}{7} \times 217 = 909.33\ cm^3$

Weight of sphere = 909.33 × 4.5 = 4092 gm = 4.092 kg

Question: 24

Given,

In-radius of bowl (r_i) = 4 cm

Thickness of steel = 0.5 cm

External radius of bowl (r_e)= 4 + 0.5 = 4.5 cm

Volume of metal = $\frac{2}{3}\pi r_e^3 - \frac{2}{3}\pi r_i^3$

$= \frac{2}{3}\pi\ (r_e^3 - r_i^3) = \frac{2}{3}\pi(4.5^3 - 4^3) = \frac{2}{3} \times \frac{22}{7} \times (91.25 - 64)$

$= \frac{2}{3} \times \frac{22}{7} \times 27.125 = 56.83\ cm^3$

Exercise : CCE QUESTIONS

Question: 1

The length, bread

Solution:

Given: Length = 15 cm

Breadth = 12 cm

Height = 4.5 cm

Volume of a cuboid = Length × Breadth × Height

Volume = 15 cm ×12 cm ×4.5 cm = 810 cm^3

Question: 2

A cuboid is 12 cm

Solution:

Given: Length = 12 cm

Breadth = 9 cm

Height = 8 cm

Total surface area of a cuboid = 2[(Length ×Breadth) + (Breadth ×Height) + (Height ×Length)]

Total surface area = 2[(12×9) + (9×8) + (8×12)] cm^2 = 2(108+72+96) cm^2

= 2(276) cm^2 = 552 cm^2

Question: 3

The length, bread

Solution:

Given: Length = 15 m

Breadth = 6 m

Height = 5 m

Lateral surface area of a cuboid = 2(Length +Breadth) × Height

1 m = 10dm

⇒ 5dm =0.5m

Lateral surface area = 2(15+6) × 0.5 m^2 = 1× 21 m^2

= 21 m^2

Question: 4

A beam 9 m long,

Solution:

Given: Length = 9 cm

Breadth = 40 cm

Height = 20 cm

Volume of a cuboid = Length × Breadth × Height

1 m =100 cm

⇒ 40 cm= 0.4 m and 20 cm =0.2 m

Volume = 9 m × 0.4m × 0.2m = 0.72 m^3

Given that 1 cm^3 weighs 50 kg

⇒ 0.72 m^3 weighs 50 × 0.72 kg = 36 kg

Question: 5

The length of the

Solution:

Longest rod = diagonal of the cuboid = $\sqrt{(l^2 + b^2 + h^2)}$

Length of longest rod = $\sqrt{(10^2 + 10^2 + 5^2)} = \sqrt{(100 + 100 + 25)}$

= $\sqrt{225}$ = 15m

Question: 6

What is the maxim

Solution:

Maximum length of a pencil = diagonal of the cuboid

Now, the diagonal of cuboid is = $\sqrt{l^2 + b^2 + h^2}$

Thus,

Length of longest rod

= $\sqrt{(8^2 + 6^2 + 5^2)}$

= $\sqrt{(64 + 36 + 25)}$

= $\sqrt{125}$

= $5\sqrt{5}$ cm

= 5(2.24) cm

= 11.2 cm

Question: 7

The number of pla

Solution:

Volume of a cuboid = Length × Breadth × Height

Volume of pit = 40 m × 12 m × 16 m = 7680 m^3

Volume of plank = 4 m × 5 m × 2 m = 40 m^3

No. of planks = $\frac{\text{Volume of Pit}}{\text{volume of Plank}} = \frac{7680}{40}$

= 192

Question: 8

How many planks o

Solution:

Volume of a cuboid = Length × Breadth × Height

1 m =100 cm

Volume of pit = 20 m × 6 m × 0.5 m = 60 m^3

Volume of plank = 5 m × 0.25 m × 0.1 m = 0.125 m^3

No. of planks = $\frac{\text{Volume of Pit}}{\text{volume of Plank}} = \frac{60}{0.125}$

= 480

Question: 9

How many bricks w

Solution:

Volume of a cuboid = Length × Breadth × Height

1 m =100 cm

Volume of wall = 8 m × 6 m × 0.225 m = 10.8 m^3

Volume of a brick = 0.25 m × 0.1125 m × 0.06 m = 0.0016875 m^3

No. of bricks = $\frac{\text{Volume of wall}}{\text{volume of brick}} = \frac{10.8}{0.0016875}$

= 6400

Question: 10

How many persons

Solution:

Volume of a cuboid = Length × Breadth × Height

Volume of hall = 20 m × 15 m × 4.5 m = 1350 m^3

Volume of air required by 1 person = 5 m^3

No. of persons = $\frac{\text{Volume of hall}}{\text{Volume of air required by 1 person}} = \frac{1350}{5}$

=270

Question: 11

A river 1.5 m dee

Solution:

Volume of a cuboid = Length × Breadth × Height

Length of the river = Speed of river = 3km (in an hr)

1km =1000 m and 1 hour =60 min

Speed in m per minute = $3 \times \frac{1000}{60} = 50\text{m per min}$

Volume of water that runs in a minute = 1.5 m × 30 m × 50 m = 2250 m^3

Question: 12

The lateral surfa

Solution:

Lateral surface area of a cube = $4(\text{side})^2$

Given Lateral surface area = 256 m^2

⇒ $4(\text{side})^2 = 256m^2$

⇒ $(\text{side})^2 = \frac{256}{4}m^2$

⇒ (side) = √64m= 8m

Volume of a cube = $(\text{side})^3$

⇒ Volume = $(8)^3$ m^3 = 512 m^3

Question: 13

The total surface

Solution:

Total surface area of a cube = $6(\text{side})^2$

Given Total surface area = 96 cm^2

$\Rightarrow 6(\text{side})^2 = 96\text{m}^2$

$\Rightarrow (\text{side})^2 = \frac{96}{6}\text{cm}^2$

$\Rightarrow (\text{side}) = \sqrt{16}\text{cm} = 4\text{cm}$

Volume of a cube = $(\text{side})^3$

$\Rightarrow$ Volume = $(4)^3$ cm^3 = 64 cm^3

Question: 14

The volume of a c

Solution:

Volume of a cube = $(\text{side})^3$

Given volume = 512 cm^3

$\Rightarrow (\text{side})^3 = 512$ cm^3

$\Rightarrow$ side = $\sqrt[3]{512}$ = 8 cm

Total surface area of a cube = $6(\text{side})^2$

$\Rightarrow$ Total surface area = $6(8)^2$cm^2 = 384 cm^2

Question: 15

The length of the

Solution:

Length of the longest rod = diagonal of the cube = side $\sqrt{3}$

Length of longest rod =10 $\sqrt{3}$ cm

Question: 16

If the length of

Solution:

Diagonal of the cube = side $\sqrt{3}$

Given diagonal =8 $\sqrt{3}$ cm = side $\sqrt{3}$

$\Rightarrow$ side = 8 cm

Total surface area of a cube = $6(\text{side})^2$

$\Rightarrow$ Surface area = $6(8)^2 = 6\times64 = 384$ cm^2

Question: 17

If each edge of a

Solution:

Let original side be x, on increasing it by 50% i.e. $\frac{50}{100} = \frac{1}{2}$

New side will be $x + \frac{1}{2}x = \frac{3}{2}x$

Total surface area of a cube = $6(\text{side})^2$

Original surface area = $6\,(x)^2$

New surface area = $6\,(\frac{3}{2}x)^2 = 6\times\frac{9}{4}x^2 = \frac{27}{2}x^2$

Change in surface area = $\frac{27}{2}x^2 - 6\,(x)^2$

Taking LCM of 2 and 1 = 2

$\Rightarrow \frac{27x^2 - 12x^2}{2} = \frac{15}{2}x^2$

The percentage increase in its surface area is $\frac{\frac{15}{2}x^2}{6x^2} \times 100\% = 125\%$

Question: 18

Three cubes of me

Solution:

Here, the volume of three cubes = volume of the new cube

Volume of a cube = $(\text{side})^3$

Volume of three cubes = $(3)^3 + (4)^3 + (5)^3 = (27 + 64 + 125)\ cm^3 = 216\ cm^3$

$\Rightarrow$ Volume of new cube = $216\ cm^3 = (\text{side})^3$

$\Rightarrow (\text{side})^3 = (6\ cm)^3$

$\Rightarrow$ side = 6cm

Lateral surface area = $4(\text{side})^2 = 4(6)^2 = 144cm^2$

Question: 19

In a shower, 5 cm

Solution:

1 hectare = $10000\ m^2$

2 hectares = $20000\ m^2$

1 cm = 0.01 m $\Rightarrow$ 5cm= 0.05 m

Volume of water that falls on 2 hectares of ground = $20000 \times 0.05\ m^3 = 1000\ m^3$

Question: 20

Two cubes have th

Solution:

Volume of a cube = $(\text{side})^3$

Let the sides be x and y

Ratio of volumes = $\frac{x^3}{y^3} = \frac{1}{27}$

$\Rightarrow \frac{x}{y} = \frac{1}{3}$

Surface area of a cube = $6(\text{side})^2$

Ratio of surface areas = $\frac{x^2}{y^2} = \frac{1}{3^2} = \frac{1}{9} = 1{:}\ 9$

Question: 21

If each side of a

Solution:

Let original side be x, New side will be 2x

Volume of a cube = $(\text{side})^3$

Original volume = $(x)^3$

New volume = $(2x)^3 = 8x^3$

So, the volume is 8 times of the original volume

Question: 22

The diameter of t

Solution:

Volume of a cylinder = $\pi r^2 h$

Diameter = 6cm ⇒ radius = 3cm

⇒ Volume = $\frac{22}{7} \times 3^2 \times 14$

= 22 × 9 × 2 = 396cm^3

Question: 23

If the diameter o

Solution:

Curved surface area of a cylinder = $2\pi rh$

Diameter = 28 cm ⇒ radius = 14 cm

⇒ Curved surface area = $2\times\frac{22}{7} \times 14 \times 20$

= 44 × 40 =1760 cm^2

Question: 24

If the curved sur

Solution:

Curved surface area of a cylinder = $2\pi rh$

⇒ Curved surface area = $2 \times \frac{22}{7} \times 14 \times h = 1760\ cm^2$

⇒ $h = \frac{1760}{44 \times 2} = 20\ cm$

Question: 25

The height of a c

Solution:

Curved surface area of a cylinder = $2\pi rh$

⇒ Curved surface area = 1760 cm^2

⇒ $2 \times \frac{22}{7} \times r \times 14 = 1760\ cm^2$

⇒ $r = \frac{1760}{44 \times 2} = 20\ cm$

Volume of a cylinder = $\pi r^2 h$

Volume = $\frac{22}{7} \times 20^2 \times 14$

= 17,600 cm^3

Question: 26

The curved surfac

Solution:

Curved surface area of a cylinder = $2\pi rh$

⇒ Curved surface area = $2 \times \frac{22}{7} \times r \times h = 264\ m^2$

$\Rightarrow r = \frac{264 \times 7}{44 \times h} = \frac{42}{h}$

Volume of a cylinder = $\pi r^2 h$

Volume = $\frac{22}{7} \times \left(\frac{42}{h}\right)^2 \times h = 924 m^3$

$\Rightarrow h = \frac{22 \times 42 \times 6}{924}$

$\Rightarrow h = \frac{42 \times 6}{42} = 6 \text{ m}$

Question: 27

The radii of two

Solution:

Let the radii be 2x and 3x respectively and heights be 5y and 3y respectively.

Curved surface area of a cylinder = $2\pi rh$

⇒ Ratio of their Curved surface area = $\frac{2\pi rh}{2\pi RH} = \frac{2x \times 5y}{3x \times 3y} = \frac{10}{9}$

Question: 28

The radii of two

Solution:

Let the radii be 2x and 3x respectively and heights be 5y and 3y respectively.

Volume of a cylinder = $\pi r^2 h$

⇒ Ratio of their Volumes = $\frac{\pi r^2 h}{\pi R^2 H} = \frac{2x^2 \times 5y}{3x^2 \times 3y} = \frac{20}{27}$

Question: 29

The ratio between

Solution:

Let the radius be 2x and height be 3x respectively.

Volume of a cylinder = $\pi r^2 h$

⇒ Volume = $\frac{22}{7} \times (2x)^2 \times 3x = 1617$

$\Rightarrow \frac{22}{7} \times x^3 \times 12 = 1617$

$\Rightarrow x^3 = \frac{1617 \times 7}{22 \times 12} = \frac{343}{8}$

$\Rightarrow x = \frac{7}{2} = 3.5$

So, radius = 2× 3.5 =7 cm and height = 3× 3.5 = 10.5 cm

Total surface area of a cylinder = $2\pi r(r + h)$

⇒ T.S.A. $= 2 \times \frac{22}{7} \times 7(7 + 10.5) = 44 \times 17.5 = 770 \text{ cm}^2$

Question: 30

Two circular cyli

Solution:

Let the heights be h = x and H=2x respectively of the two cylinders.

Volume of a cylinder = $\pi r^2 h$

Given that $\pi r^2 h = \pi R^2 H$

$\Rightarrow \frac{r^2}{R^2} = \frac{2x}{x}$

$\Rightarrow r : R = \sqrt{2} : 1$

Question: 31

The ratio between

Solution:

Total surface area of a cylinder = $2\pi r(r+h)$

Curved surface area of a cylinder = $2\pi rh$

$\Rightarrow \frac{2\pi rh}{2\pi r(r+h)} = \frac{1}{2}$

$\Rightarrow 2h = r + h \Rightarrow h = r$

Given that total surface area = 616 cm^2

$\Rightarrow 2 \times \frac{22}{7} \times 2r^2 = 616$

$\Rightarrow r^2 = 7 \times 7$

So, r = h = 7 cm

Volume of a cylinder = $\pi r^2 h$

$\Rightarrow \frac{22}{7} \times 49 \times 7 = 1078\ cm^3$

Question: 32

In a cylinder, if

Solution:

Let the radius be r and height be h

Volume of a cylinder = $\pi r^2 h$

When radius = $\frac{1}{2}r$ and height = 2h

Volume = $\pi\left(\frac{r}{2}\right)^2 \times 2h = \pi\frac{r^2}{2}h$

The volume will be halved.

Question: 33

The number of coi

Solution:

Volume of a cylinder = $\pi r^2 h$

Volume of the coin = $\pi(\frac{1.5}{2})^2 \times 0.2$

Volume of the cylinder = $\pi(\frac{4.5}{2})^2 \times 10$

Number of coins = $\frac{\text{Volume of the cylinder}}{\text{Volume of the coin}}$

$= \frac{\pi\left(\frac{4.5}{2}\right)^2 \times 10}{\pi\left(\frac{1.5}{2}\right)^2 \times 0.2}$

$= 9 \times 50 = 450$

Question: 34

The radius of a w

Solution:

Let radius and length of a wire be r and h respectively

Volume of a wire = $\pi r^2 h$

If radius = $\frac{r}{3}$ and new length = H

Volume of the wire = $\pi(\frac{r}{3})^2 \times H = \pi r^2 h$

⇒ H = 9h i.e. 9 times

Question: 35

The diameter of a

Solution:

Curved surface area of a cylinder = $2\pi rh$

1m= 100cm, radius = 42 cm = 0.42m

Curved surface area $= 2 \times \frac{22}{7} \times 0.42 \times 1 = 2.64\ m^2$

Area of the playground = 500 × 2.64 m^2 = 1320 m^2

Question: 36

2.2 dm^3

Solution:

Given volume of the cylindrical wire is 2.2dm^3

Volume of a wire = $\pi r^2 h$

1 dm = 10 cm ⇒ 0.50 cm = 0.05 dm

Volume of the wire = $\pi(0.25)^2 \times \text{length of the wire} = 2.2$

$$\Rightarrow h = \frac{2.2 \times 7}{22 \times 0.0625} = 11.2\ dm$$

1 m= 10 dm

⇒ 11.2 dm = 112 m

Question: 37

The lateral surfa

Solution:

The curved surface area of a cylinder is only the lateral surface area

And, we know that the curved surface area = 2πrh

Question: 38

The height of a c

Solution:

Curved surface area of a cone = $\pi r l$

where $l = \sqrt{h^2 + r^2}$

Here, r=7cm and h=24cm

$l = \sqrt{24^2 + 7^2}$

$= \sqrt{625}$

$= 25\text{cm}$

$\Rightarrow \frac{22}{7} \times 7 \times 25$

$= 550\text{cm}^2$

Question: 39

The volume of a r

Solution:

Volume of a cone = $\frac{1}{3}\pi r^2 h$

$\Rightarrow \frac{1}{3}\pi 6^2 12$

$= \pi \times 36 \times 4$

$= (144\pi)\text{cm}^3$

Question: 40

How much cloth 2.

Solution:

Curved surface area of a cone = πrl

where $l = \sqrt{h^2 + r^2}$

Here, r=7m and h=24m

$l = \sqrt{24^2 + 7^2}$

$= \sqrt{625}$

$= 25\text{m}$

$\Rightarrow \frac{22}{7} \times 7 \times 25 = 550\text{m}^2$

The cloth required = $\frac{550}{2.5}$

= 220 m

Question: 41

The volume of a c

Solution:

Volume of a cone = $\frac{1}{3}\pi r^2 h$

Given volume = 1570 cm^3

$\Rightarrow \frac{1}{3}\pi r^2 \times 15 = 3.14 \times r^2 \times 5 = 15.7r^2\text{cm}^3$

$\Rightarrow 15.7r^2 = 1570$

$\Rightarrow r^2 = 100 \Rightarrow r = 10\text{cm}$

Question: 42

The height of a c

Solution:

Volume of a cone = $\frac{1}{3}\pi r^2 h$

where slant height $l = \sqrt{h^2 + r^2}$

Here, l=28 cm and h=21 cm

$r = \sqrt{28^2 - 21^2}$

$= \sqrt{441}$

$= 21\text{cm}$

Volume $= \frac{1}{3} \times \frac{22}{7} \times 21^2 \times 21$

$= 7546 \text{ cm}^3$

Question: 43

The volume of a r

Solution:

Given:

Volume of cone = 1232 cm^3

As we know, Volume of a cone = $\frac{1}{3}\pi r^2 h$

$\Rightarrow \frac{1}{3} \times \frac{22}{7} \times r^2 \times 24 = 1232 \text{ cm}^3$

$\Rightarrow r^2 = 49$

$\Rightarrow r = 7$ cm

slant height $l = \sqrt{h^2 + r^2}$

Here, r =7 cm and h = 24 cm

$l = \sqrt{7^2 + 24^2} = \sqrt{625} = 25\text{cm}$

Curved surface area of a cone = $\pi r l$

$\Rightarrow \frac{22}{7} \times 7 \times 25$

$= 550\text{cm}^2$

Question: 44

If the volumes of

Solution:

Volume of a cone = $\frac{1}{3}\pi r^2 h$

$\Rightarrow \frac{\frac{1}{3}\pi r^2 h}{\frac{1}{3}\pi R^2 H} = \frac{1}{4}$ and $\frac{r^2}{R^2} = \frac{16}{25}$

$\Rightarrow \frac{h}{H} = \frac{1 \times 25}{4 \times 16}$

$\Rightarrow \frac{h}{H} = \frac{25}{64}$

Question: 45

If the height of

Solution:

Volume of a cone = $\frac{1}{3}\pi r^2 h$

If height is doubled,

volume = $\frac{1}{3}\pi r^2 \times 2h$

Volume = $\frac{2}{3}\pi r^2 h$

Increase in volume = $\dfrac{\frac{2}{3}\pi r^2 h - \frac{1}{3}\pi r^2 h}{\frac{1}{3}\pi r^2 h} \times 100\%$

$= \dfrac{\frac{1}{3}\pi r^2 h}{\frac{1}{3}\pi r^2 h} \times 100\%$

$= 100\%$

Thus, there will be 100% increase in the volume.

Question: 46

The curved surfac

Solution:

Curved surface area of a cone = $\pi r l$

Given that curved surface area of 1^{st} = $2\times$ curved surface area of 2^{nd}

And slant height of 2^{nd} = $2\times$ slant height of 1^{st}

$\Rightarrow L = 2l$

$\Rightarrow \dfrac{\pi r l}{\pi R L} = \dfrac{2}{1}$

$\Rightarrow \dfrac{r}{R} = \dfrac{2 \times 2l}{1 \times l}$

$\Rightarrow r : R = 4 : 1$

Question: 47

The ratio of the

Solution:

Given that heights and radii of cone and cylinder are equal

Volume of a cone = $\frac{1}{3}\pi R^2 H$

Volume of a cylinder = $\pi r^2 h$

Ratio of their volumes = $\frac{\pi r^2 h}{\frac{1}{3}\pi R^2 H} = \frac{3}{1}$

{because h=H and r=R}

Ans – 3:1

Question: 48

A right circular

Solution:

Let height of cylinder and cone be H and h respectively

Given that radii of cone and cylinder are equal

Volume of a cone $= \frac{1}{3}\pi r^2 h$

Volume of a cylinder $= \pi r^2 H$

Given $\frac{1}{3}\pi r^2 h = \pi r^2 H$

$\Rightarrow \frac{H}{h} = \frac{1}{3}$

Ans: 1 : 3

Question: 49

The radii of the

Solution:

Given that radii of cone and cylinder are 4x and 3x respectively and

height of cylinder and cone are 2y and 3y respectively

Volume of a cone $= \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi \times 4x^2 \times 3y$

Volume of a cylinder $= \pi r^2 h = \pi \times 3x^2 \times 2y$

$\Rightarrow \frac{\text{Volume of a cylinder}}{\text{Volume of a cone}} = \frac{\pi \times 3x^2 \times 2y}{\frac{1}{3}\pi \times 4x^2 \times 3y}$

$\Rightarrow \frac{\text{Volume of a cylinder}}{\text{Volume of a cone}} = \frac{9 \times 2}{16}$

$\Rightarrow \frac{\text{Volume of a cylinder}}{\text{Volume of a cone}} = \frac{9}{8}$

Question: 50

If the height and

Solution:

Volume of a cone $= \frac{1}{3}\pi r^2 h$

If height and radius are doubled, volume $= \frac{1}{3}\pi(2r)^2 \times 2h = \frac{8}{3}\pi r^2 h$

The volume of the cone becomes 8 times.

Question: 51

A solid metallic

Solution:

Volume of a cone $= \frac{1}{3}\pi r^2 h$

Volume of a cylinder $= \pi r^2 h$

Volume of solid metallic cylinder $= \pi(3)^2 \times 5 = 45\pi\ cm^3$

1cm=10mm

Volume of solid coin $= \frac{1}{3}\ \pi(0.1)^2 \times 1 = \frac{1}{3} \times 0.01\pi\ cm^3$

No. of coins $= \frac{\text{Volume of solid metallic cylinder}}{\text{Volume of solid coin}}$

$= \frac{45\pi \times 3\ cm^3}{0.01\pi\ cm^3}$

$= 13500$

Question: 52

A conical tent is

Solution:

As each person needs 4 m ^{2} spaces on ground, so 11 persons will need 44 m ^{2} space on the ground.Therefore, Area of ground = 44 m ^{2} $\Rightarrow \pi r^2 = 44$

$\Rightarrow \frac{22 \times r^2}{7} = 44$

$\Rightarrow r^2 = 14$Each person needs $= \frac{220}{11} = 20m^3$ of air Therefore volume of tent = 220 m^3

Volume of a cone $= \frac{1}{3}\pi r^2 h \Rightarrow \frac{1}{3}\pi r^2\ h\ =\ 220$

$\Rightarrow \frac{1}{3} \times \frac{22}{7} \times 14 \times\ h\ =\ 220$

$\Rightarrow h = 15cm$

Question: 53

The volume of a s

Solution:

Volume of a sphere $= \frac{4}{3}\pi r^3$

Volume $= \frac{4}{3}\pi(2r)^3 = \frac{32}{3}\pi r^3$

Question: 54

The volume of a s

Solution:

Volume of a sphere $= \frac{4}{3}\pi r^3$

Volume $= \frac{4}{3}\pi(10.5)^3$

$= \frac{4}{3} \times \frac{22}{7} \times (10.5)^3$

$= 4851cm^3$

Question: 55

The surface area

Solution:

Surface area of a sphere $= 4\pi r^2$

Surface area $= 4\pi(21)^2$

$= 4 \times \frac{22}{7} \times (21)^2$

$= 5544cm^2$

Question: 56

The surface area

Solution:

Surface area of a sphere $= 4\pi r^2$

Given Surface area = 1386 cm^2

$\Rightarrow 4 \times \frac{22}{7} \times r^2 = 1386$

$\Rightarrow r^2 = \frac{1386 \times 7}{88} = \frac{441}{4}$

$\Rightarrow r = \frac{21}{2}$

Volume of a sphere $= \frac{4}{3}\pi r^3$

Volume $= \frac{4}{3}\pi\left(\frac{21}{2}\right)^3$

$= \frac{4}{3} \times \frac{22}{7} \times \left(\frac{21}{2}\right)^3$

$= 4851 cm^3$

Question: 57

If the surface ar

Solution:

Surface area of a sphere $= 4\pi r^2$

Given Surface area $= (144\pi)m^2$,

$\Rightarrow 4 \times \pi \times r^2 = 144\pi$

$\Rightarrow$ r= 6m

Volume of a sphere $= \frac{4}{3}\pi r^3$

Volume $= \frac{4}{3}\pi(6)^3 = 288\pi m^3$

Question: 58

The volume of a s

Solution:

Volume of a sphere $= \frac{4}{3}\pi r^3$

Given Volume= $38808\ cm^3$.

$\Rightarrow \frac{4}{3}\pi r^3 = 38808$

$\Rightarrow r^3 = 38808 \times \frac{21}{88} = 9261$

$\Rightarrow$ r=21cm

Surface area of a sphere $= 4\pi r^2$

Surface area $= 4 \times \frac{22}{7}(21)^2 = 5544\ cm^2$

Question: 59

If the ratio of t

Solution:

Volume of a sphere $= \frac{4}{3}\pi r^3$

Given that $\frac{\frac{4}{3}\pi r^3}{\frac{4}{3}\pi R^3} = \frac{1}{8}$

$\Rightarrow \frac{r}{R} = \frac{1}{2}$

Surface area of a sphere $= 4\pi r^2$

$$\Rightarrow \frac{4\pi r^2}{4\pi R^2} = \frac{1}{4}$$

Question: 60

A solid metal bal

Solution:

Volume of a sphere $= \frac{4}{3}\pi r^3$

Volume of the solid metal ball $= \frac{4}{3}\pi(8)^3$

Volume of smaller ball$= \frac{4}{3}\pi(2)^3$

No. of balls $= \frac{\text{Volume of the solid metal ball}}{\text{Volume of smaller ball}}$

$= \frac{\frac{4}{3}\pi(8)^3}{\frac{4}{3}\pi(2)^3}$

$= 64$

Question: 61

A cone is 8.4 cm

Solution:

Volume of a cone $= \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi(2.1)^2 \times 8.4$

$= 12.348\pi\ \text{cm}^3$

On recasting a cone into sphere, the volume will remain same

Volume of a sphere $= \frac{4}{3}\pi r^3$

Volume of sphere $=12.348\ \pi\ \text{cm}^3$

$$\Rightarrow \frac{4}{3}\pi r^3 = 12.348\pi$$

$\Rightarrow r^3 = 12.348 \times \frac{3}{4} = 9.261$

$\Rightarrow r = 2.1\text{cm}$

Question: 62

A solid lead ball

Solution:

Volume of a sphere $= \frac{4}{3}\pi r^3 = \frac{4}{3}\pi(6)^3 = 288\pi\ \text{cm}^3$

On recasting a sphere into cylinder, the volume will remain same

Volume of a cylinder $= \pi r^2 h$

Radius = 0.1 cm

$\Rightarrow \pi(0.1)^2 h = 288\pi$

$\Rightarrow h = 288 \times \frac{1}{0.01}$

$= 28800\text{cm}$

$= 288\ \text{m}$ ($\because$ 1m =100 cm)

$\Rightarrow h = 288$ m

Question: 63

A metallic sphere

Solution:

Volume of a sphere $= \frac{4}{3}\pi r^3 = \frac{4}{3}\pi(10.5)^3$ cm^3

Volume of a cone $= \frac{1}{3}\pi r^2 h$

$= \frac{1}{3}\pi(3.5)^2 \times 3$

$= \pi(3.5)^2 cm^3$

No. of cones $= \frac{\text{Volume of a sphere}}{\text{Volume of a cone}}$

$= \frac{\frac{4}{3}\pi(10.5)^3}{\pi(3.5)^2}$

$= 126$

Question: 64

How many lead sho

Solution:

Volume of a cuboid = l× b× h = 9× 11× 12 cm^3

Radius of a lead shot = 0.15 cm

Volume of a lead shot $= \frac{4}{3}\pi r^3 = \frac{4}{3}\pi(0.15)^3$ cm^3

No. of lead shot $= \frac{\text{Volume of a cuboid}}{\text{Volume of a lead shot}}$

$= \frac{9\times 11\times 12}{\frac{4}{3}\pi(0.15)^3}$

$= \frac{9 \times 11 \times 3 \times 3}{\frac{22}{7} \times 0.003375}$

$= 84000$

Question: 65

The diameter of a

Solution:

Radius of the sphere = 3 cm

Volume of a sphere $= \frac{4}{3}\pi r^3$

$= \frac{4}{3}\pi(3)^3$

$= 36\pi$ cm^3

On recasting a sphere into cylinder wire, the volume will remain same

Volume of a cylinder $= \pi r^2 h$

1cm=10mm

⇒ 2mm =0.2cm

Radius = 0.1 cm

$\Rightarrow \pi(0.1)^2 h = 36\pi$

$\Rightarrow h = 36 \times \frac{1}{0.01}$

$\Rightarrow h = 3600$cm

$\Rightarrow h = 36\ m$ ($\because$ 1m =100 cm)

Question: 66

A sphere of diame

Solution:

Radius of the sphere = 6.3 cm

Volume of a sphere $= \frac{4}{3}\pi r^3$

$\Rightarrow$ Volume of a sphere $= \frac{4}{3}\pi(6.3)^3\ cm^3$

Volume of a cone $= \frac{1}{3}\pi r^2 h$

$\Rightarrow$ Volume of a cone $= \frac{1}{3}\pi r^2 \times 25.2$

$= 8.4\pi r^2 cm^3$

On recasting a sphere into a cone, volume will remain same

$\Rightarrow 8.4\pi r^2 = \frac{4}{3}\pi(6.3)^3$

$\Rightarrow r^2 = \frac{4}{3}(6.3)^3 \times \frac{1}{8.4} = 39.69$

$\Rightarrow$ r = 6.3 cm

Question: 67

A spherical ball

Solution:

Volume of a sphere $= \frac{4}{3}\pi r^3$

Volume of spherical ball $= \frac{4}{3}\pi(3)^3\ cm^3$

Volume of three balls $= \frac{4}{3}\pi(1.5)^3 + \frac{4}{3}\pi(2)^3 + \frac{4}{3}\pi r^3$

$= \frac{4}{3}\pi(3.375 + 8 + r^3)$On recasting this sphere into three spherical balls, volume will remain same

$\Rightarrow \frac{4}{3}\pi(3.375 + 8 + r^3) = \frac{4}{3}\pi(3)^3$

$\Rightarrow 11.375 + r^3 = 27$

$\Rightarrow r^3 = 15.625$

$\Rightarrow$ r = 2.5 cm

Question: 68

The radius of a h

Solution:

Surface area of a hemisphere = $2\pi r^2$

Radii are 6cm and 12 cm respectively

Ratio of surface areas $= \frac{2\pi r^2}{2\pi R^2} = \frac{6^2}{12^2} = \frac{1}{4}$

Ans 1:4

Question: 69

The volumes of th

Solution:

Volume of a sphere $= \frac{4}{3}\pi r^3$

Given Ratio of volumes of two spheres $= \frac{64}{27}$

$\Rightarrow \frac{\frac{4}{3}\pi r^3}{\frac{4}{3}\pi R^3} = \frac{r^3}{R^3} = \frac{64}{27}$

$\Rightarrow \frac{r}{R} = \frac{4}{3}$

So, r = 4x and R = 3x

Also given that the sum of radii = 7

⇒ r +R = 4x +3x =7x =7

⇒ x =1

So r = 4cm and R = 3cm

Surface area of a sphere $= 4\pi r^2$

Difference in total surface area $= 4\pi r^2 - 4\pi R^2 = 4\pi(r^2 - R^2)$

$4 \times \frac{22}{7} \times 7 = 88\ \mathrm{cm}^2$

Question: 70

A hemispherical b

Solution:

Volume of a hemisphere $= \frac{2}{3}\pi r^3 = \frac{2}{3}\pi(9)^3\ \mathrm{cm}^3$

Volume of a cylinder $= \pi r^2 h$

Volume of a cylindrical bottle$= \pi(1.5)^2 \times 4$

No. of bottles required $= \frac{\text{Volume of a hemisphere}}{\text{Volume of a cylindrical bottle}}$

$= \frac{\frac{2}{3}\pi(9)^3}{\pi(1.5)^2 \times 4}$

$= \frac{81 \times 3}{2.25 \times 1.5 \times 2} = 54$

Thus, total 54 bottles are required.

Question: 71

A cone and a hemi

Solution:

Given that Radius of the hemisphere = Radius of cone

And Volume of hemisphere = Volume of cone

Volume of a hemisphere $= \frac{2}{3}\pi r^3$

Volume of a cone $= \frac{1}{3}\pi r^2 h$

$\Rightarrow \frac{2}{3}\pi r^3 = \frac{1}{3}\pi r^2 h$

$\Rightarrow \frac{h}{r} = \frac{2}{1}$

Question: 72

A cone, a hemisph

Solution:

Given that Radius of the hemisphere = Radius of cone = Radius of cylinder

And Height of the hemisphere = Height of cone = Height of cylinder

Volume of a hemisphere $= \frac{2}{3}\pi r^3$

Volume of a cone $= \frac{1}{3}\pi r^2 h$

Volume of a cylinder $= \pi r^2 h$

Ratio of their volumes $= \frac{1}{3}\pi r^2 h : \frac{2}{3}\pi r^3 : \pi r^2 h$

$= h : 2r : 3h = 1 : 2 : 3$

Question: 73

If the volume and

Solution:

Volume of a sphere $= \frac{4}{3}\pi r^3$

Surface area of a sphere $= 4\pi r^2$

Given that volume = surface area

$\Rightarrow \frac{4}{3}\pi r^3 = 4\pi r^2$

$\Rightarrow r = 3$ units

Question: 74

Which is false in

Solution:

Inner curved surface area of a hollow cylinder = $2\pi rh$

Question: 75

Which is false?

Solution:

Curved surface area of a hemisphere = $2\pi r^2$

Question: 76

For a right circu

Solution:

A) Curved surface area of a cylinder = $2\pi rh$

$\Rightarrow 2 \times \frac{22}{7}(7) \times 14 = 616\ cm^2$

B) Total surface area of a cylinder = $2\pi r(r + h)$

$\Rightarrow 2 \times \frac{22}{7}(7) \times (7 + 14) = 924\ cm^2$

C) Volume of a cylinder = $\pi r^2 h$

$$\Rightarrow \frac{22}{7}(7^2) \times 14 = 2156 \text{ cm}^3$$

D) Total area of the end faces = $2\times \pi r^2$ {Because there are two circular faces}

$$= 2 \times \frac{22}{7} \times 49 = 308 \text{ cm}^2$$

Question: 77

Which is false?

Solution:

A) Inner curved surface area = $2\pi rh$

$$\Rightarrow 2 \times \frac{22}{7}(2) \times 63 = 792 \text{ cm}^2$$

B) Outer curved surface area = $2\pi Rh$

$$\Rightarrow 2 \times \frac{22}{7}(2.2) \times 63 = 871.2 \text{ cm}^2$$

C) Surface area of the end face = $\pi(R^2 - r^2)${Because there are two circular faces}

$$= 2 \times \frac{22}{7} \times (2.2^2 - 2^2) = 2.64 \text{ cm}^2$$

D) R = 2.2 cm, r = 2 cm and h = 63 cm

Total surface area of a hollow cylinder $= 2\pi(R + r)(h + R - r)$.

$$= 2 \times \frac{22}{7} \times 4.2 \times 63.2 = 1668.48 \text{ cm}^2$$

Question: 78

The question cons

Solution:

Slant height $l = \sqrt{h^2 + r^2}$

Here, r=7cm and l=25cm

$$h = \sqrt{25^2 - 7^2} = \sqrt{576} = 24\text{cm}$$

Volume of a cone $= \frac{1}{3}\pi r^2 h$

$$\Rightarrow \frac{1}{3} \times \frac{22}{7} \times (7)^2 \times 24 = 1232\text{cm}^2$$

Both Assertion (A) and Reason (R) are true and Reason (R) is a correct explanation of Assertion (A).

Question: 79

The question cons

Solution:

Surface area of a sphere $= 4\pi r^2$

Given Surface area = 2464 cm^2

$$\Rightarrow 4 \times \frac{22}{7} \times r^2 = 2464$$

$$\Rightarrow r^2 = \frac{2464 \times 7}{88} = 196$$

$\Rightarrow r = 14cm$

Volume of a sphere $= \frac{4}{3}\pi r^3$

Volume $= \frac{4}{3}\pi(14)^3 = \frac{4}{3} \times \frac{22}{7} \times (14)^3 = 11498\frac{2}{3}cm^3$

Both Assertion (A) and Reason (R) are true but Reason (R) is not a correct explanation of Assertion (A).

Question: 80

The question cons

Solution:

The volume of a hollow cylinder with external and internal radii R and r respectively and height h $= \pi(R^2 - r^2)h$

$= \pi(5^2 - 3^2) \times 210$

$= \frac{22}{7} \times 16 \times 210$

$= 10560cm^3$

Thus, the volume is $10560cm^3$

Both Assertion (A) and Reason (R) are true and Reason (R) is a correct explanation of Assertion (A).

Question: 81

The question cons

Solution:

Volume of a sphere $= \frac{4}{3}\pi r^3$

Volume $= \frac{4}{3}\pi(2r)^3 = \frac{32}{3}\pi r^3$

Ratio = 1:8

Reason is wrong. Assertion (A) is true and Reason (R) is false.

Question: 82

The question cons

Solution:

Curved surface area of a cone = πrl

$\Rightarrow \frac{22}{7} \times 7 \times l = 550cm^2$

⇒ l=25 cm

Both Assertion (A) and Reason (R) are true and Reason (R) is a correct explanation of Assertion (A).

Question: 83

A right circular

Solution:

True

Curved surface area of a sphere $= 4\pi r^2$

Radius of cylinder = r + r = 2r

Curved surface area of a cylinder = $2\pi rh$ **=** $2\pi \times r \times 2r = 4\pi r^2$

Question: 84

The largest possi

Solution:

True

The dimensions of the cone arediameter = r ; radius = r/2 height = rVolume of a cone $= \frac{1}{3}\pi r^2 h$

$= \frac{1}{3}\pi(\frac{r}{2})^2 \times r = \frac{1}{12}\pi r^3$

Question: 85

If a sphere is in

Solution:

True

Let the radius of sphere be r so the edge of cube = 2r

Volume of a sphere $= \frac{4}{3}\pi r^3$

Volume of a cube $= (2r)^3$

Ratio of their volumes $= 8r^3 : \frac{4}{3}\pi r^3 = 6 : \pi$

Question: 86

If the length of

Solution:

False

Diagonal of the cube = $\text{side}\sqrt{3}$

Length of longest rod = $6\sqrt{3}$ **cm**

Side = 6 cm

Exercise : FORMATIVE ASSESSMENT (UNIT TEST)

Question: 1

The radii of two

Solution:

Let the radii be 2x and 3x respectively and heights be 5y and 3y respectively.

Volume of a cylinder = $\pi r^2 h$

⇒ Ratio of their Volumes = $\frac{\pi r^2 h}{\pi R^2 H} = \frac{2x^2 \times 5y}{3x^2 \times 3y}$

Thus, the ratio of two cylinders $= \frac{20}{27}$

Question: 2

The total surface

Solution:

Total surface area of a cone = $\pi r(r + l)$

= $\pi \frac{r}{2}\left(\frac{r}{2} + 2l\right)$

$= \pi r(\frac{r}{4} + l)$

Question: 3

A cone is 8.4 cm

Solution:

Volume of a cone $= \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi(2.1)^2 \times 8.4$

$= 12.348\pi \text{ cm}^3$

On recasting a cone into sphere, the volume will remain same

Volume of a sphere $= \frac{4}{3}\pi r^3$

Volume of sphere =12.348 π cm^3

$\Rightarrow \frac{4}{3}\pi r^3 = 12.348\pi$

$\Rightarrow r^3 = 12.348 \times \frac{3}{4} = 9.261$

⇒ r = 2.1cm

Question: 4

The radius of a h

Solution:

Surface area of a hemisphere = 2πr^2

Radii are 6cm and 12 cm respectively

Ratio of surface areas $= \frac{2\pi r^2}{2\pi R^2} = \frac{6^2}{12^2} = \frac{1}{4}$

Question: 5

A copper sphere o

Solution:

Radius of the sphere = 3 cm

Volume of a sphere $= \frac{4}{3}\pi r^3 = \frac{4}{3}\pi(3)^3 = 36\pi \text{ cm}^3$

On recasting a sphere into cylinder wire, the volume will remain same

Volume of a cylinder $= \pi r^2 h$

$\Rightarrow \pi(r)^2 36 = 36\pi$

$\Rightarrow r = 1\text{cm}$

Question: 6

Find the lateral

Solution:

Total surface area of a cube = 6(side)^2

⇒ Total surface area = 6(8)^{2}cm^2 = 384 cm^2

Lateral surface area of a cube = 4(side)^2

⇒ Total surface area = 4(8)^{2}cm^2 = 256 cm^2

Question: 7

Find the lateral

Solution:

Total surface area of a cuboid = 2[(Length ×Breadth) + (Breadth ×Height) + (Height ×Length)]

Total surface area = 2[(40×30) + (30×20) + (20×40)] cm^2 = 2(1200+600+800) cm^2

= 2(2600) cm^2 =5200 cm^2

Lateral surface area of a cuboid = 2(Length +Breadth) ×Height

Lateral surface area = 2(40+30) × 20 cm^2 = 140× 20 cm^2

= 2800 cm^2

Question: 8

The total surface

Solution:

Total surface area of a cylinder = $2\pi r(r+h)$

Curved surface area of a cylinder = $2\pi rh$

$\Rightarrow \dfrac{2\pi rh}{2\pi r(r+h)} = \dfrac{1}{3}$

⇒ 3h=r+h ⇒ 2h=r

Given that total surface area = 462 cm ^{2}

⇒ $2 \times \frac{22}{7} \times \frac{3}{2} r^2 = 462$

⇒ r^2 = 7× 7

So, r = 7 cm , h =3.5cm

Volume of a cylinder = $\pi r^2 h$

$\Rightarrow \dfrac{22}{7} \times 49 \times 3.5 = 539\ \mathrm{cm}^3$

Question: 9

The length and br

Solution:

Area of the floor $= \frac{\text{Cost of carpeting}}{\text{rate of carpeting}} = \frac{1350}{25} = 54\ \mathrm{m}^2$

Given that length and breadth are in ratio 3:2, so l = 3x and b = 2x

⇒ l= 9 m and b =6 m

Lateral surface area of a cuboid = 2(Length +Breadth) ×Height

Lateral surface area $= \frac{2580}{15} = 172\ \mathrm{m}^2$

Adding door and window, Lateral surface area = 180 m^2

$\Rightarrow 2(l+b)h = 2(15 \times h) = 180$

⇒ h = 6 m

Question: 10

If the radius of

Solution:

Volume of a sphere $= \frac{4}{3}\pi r^3$

Let the radius be 'r'Increased Radius = 1.1r

Volume $= \frac{4}{3}\pi(1.1r)^3 = \frac{4\times1.331}{3}\pi r^3$

Change in volume $= \frac{\frac{4}{3}\times1.331\pi r^3-\frac{4}{3}\pi r^3}{\frac{4}{3}\pi r^3}\times 100\% = \frac{0.331}{1}\times 100\% = 33.1\%$

Question: 11

The surface area

Solution:

Curved surface area of a sphere $= 4\pi r^2$

Curved Surface area of a cone $= \pi rl$

Given that $\Rightarrow 4\pi r^2 = 5(\pi rl)$

$$\Rightarrow l = \frac{4\times 25}{5\times 4} = 5cm$$

l= 5 cm and r= 4 cm

$h = \sqrt{5^2 - 4^2} = \sqrt{9} = 3cm$

Volume $= \frac{1}{3}\times\frac{22}{7}\times 4^2\times 3 = 50.3\ cm^3$

Question: 12

A rectangular tan

Solution:

Volume = l× b × h

Volume = 5× 4.5× × 2.1=47.25 m^3

Area over which it is spread = 13.5 x 25 - 5 x 4.5 = 33.75 - 220 = 11.75 mRise in level $=\frac{47.25}{11.75}$**= 4.2 m**

Question: 13

A joker’s cap is

Solution:

Curved surface area of a cone = πrl

where $l = \sqrt{h^2 + r^2}$

Here, r=7cm and h=24cm

$l = \sqrt{24^2 + 7^2} = \sqrt{625} = 25cm$

$$\Rightarrow \frac{22}{7}\times 7\times 25 = 550cm^2$$

Area of 10 such caps = 5500 cm^2

Question: 14

The volume of a r

Solution:

Volume of a cone $= \frac{1}{3}\pi r^2 h$

Given volume = 9856 cm^3

Radius of cone = 14 cm

$\Rightarrow \frac{1}{3}\pi(14)^2 \times h = \frac{22}{21} \times 196 \times h = 9856cm^3$

$\Rightarrow h = 48$ cm

Question: 15

Into a circular d

Solution:

Volume of a cylinder = $\pi r^2 h$

Volume of the cylinder = $\pi(4.2)^2 \times 3.5$

Number of bags $= \frac{\text{Volume of the cylinder}}{\text{Volume of the wheat bags}} = \frac{\pi(4.2)^2 \times 3.5}{2.1} = 92$

Question: 16

A well with 10 m

Solution:

Volume of a cylinder = $\pi r^2 h$

Radius of well = 5m , Height of well = 14m

Volume of the well = $\pi(5)^2 \times 14 = \frac{22}{7} \times 25 \times 14 = 1100m^2$

For embankment, radius = 5+5 =10 m and let height be h m

Volume of well = Volume of embankment

$\Rightarrow \pi[(10)^2 - (5)^2] \times h = \frac{22}{7} \times 75 \times h = 1100$

⇒ h = 4.67 m

Question: 17

How many metres o

Solution:

Curved surface area of a cone = πrl

where $l = \sqrt{h^2 + r^2}$

Here, r=7m and h=24m

$l = \sqrt{24^2 + 7^2} = \sqrt{625} = 25m$

$\Rightarrow \frac{22}{7} \times 7 \times 25 = 550m^2$

The cloth required $= \frac{550}{5} = 110m$

Question: 18

The volume of a s

Solution:

Volume of a cylinder$= \pi r^2 h$ **, Given volume =** $1584\ cm^3$

$\Rightarrow \frac{22}{7} \times r^2 \times 14 = 1584\ cm^3$

⇒ r^2 = 36 ⇒ r =6 cm

Total surface area of a cylinder = $\pi r(r + h)$

$\Rightarrow \dfrac{22}{7} \times 6 \times (6 + 14) = 754.29 \text{ cm}^2$

Question: 19

The volume of two

Solution:

Volume of a sphere $= \frac{4}{3}\pi r^3$

Given Ratio of volumes of two spheres $= \frac{64}{27}$

$\Rightarrow \dfrac{\frac{4}{3}\pi r^3}{\frac{4}{3}\pi R^3} = \dfrac{r^3}{R^3} = \dfrac{64}{27}$

$\Rightarrow \frac{r}{R} = \frac{4}{3}$

So, r = 4x and R = 3x

Also given that the sum of radii = 7

⇒ r +R = 4x +3x =7x =7

⇒ x =1

So, r = 4cm and R = 3cm

Surface area of a sphere $= 4\pi r^2$

Difference in total surface area = $4\pi r^2 - 4\pi R^2 = 4\pi(r^2 - R^2)$

$4 \times \frac{22}{7} \times 7 = 88 \text{ cm}^2$

Question: 20

The radius and he

Solution:

Since the radius and height of a cone is 4:3 so let radius = 4x and height = 3x

Volume of a cone $= \frac{1}{3}\pi r^2 h$ **, Given volume =** 2156 cm^3.

$\Rightarrow \dfrac{1}{3} \times \dfrac{22}{7} \times (4x)^2 \times 3x = 2156 \text{ cm}^3$

⇒ $x^3 = \frac{343}{8}$ **⇒ x** $= \frac{7}{2}$

So , r =14 cm and height = 10.5 cm

slant height $l = \sqrt{h^2 + r^2}$

Here, r=14 cm and h=10.5 cm

$l = \sqrt{14^2 + 10.5^2} = \sqrt{306.25} = 17.5\text{cm}$

Curved surface area of a cone = $\pi r l$

$\Rightarrow \dfrac{22}{7} \times 14 \times 17.5 = 770 \text{ cm}^2$

Question: 21

The radius of the

Solution:

Curved surface area of a cone = $\pi r l$

where $l = \sqrt{h^2 + r^2}$

Here, r=14cm and h=24cm

$l = \sqrt{24^2 + 14^2} = \sqrt{772} = 27.8\text{cm}$

$\Rightarrow \frac{22}{7} \times 14 \times 27.8 = 1223\ \text{cm}^2$

Total surface area of a cone = $\pi r(r + l)$

$\Rightarrow \frac{22}{7} \times 14 \times (14 + 27.8) = 1839\ \text{cm}^2$

Volume of a cone $= \frac{1}{3}\pi r^2 h$

$\Rightarrow \frac{1}{3} \times \frac{22}{7} \times (14)^2 \times 24 = 4928\ \text{cm}^3$

Question: 22

Two cylindrical v

Solution:

Volume of a cylinder$= \pi r^2 h$

Volume of first vessel = $\frac{22}{7} \times 15^2 \times 25 = 17678.57\ \text{cm}^3$

Volume of second vessel = $\frac{22}{7} \times 10^2 \times 18 = 5657.14\ \text{cm}^3$

The volume of the third vessel = volume of first vessel + volume of second vessel

$\Rightarrow \frac{22}{7} \times r^2 \times 33 = 17678.57 + 5657.14$

$\Rightarrow r^2 = 225 \Rightarrow r = 15\ \text{cm}$

Question: 23

The ratio of the

Solution:

Total surface area of a cylinder = $2\pi r(r + h)$

Curved surface area of a cylinder = $2\pi rh$

$\Rightarrow \frac{2\pi rh}{2\pi r(r + h)} = \frac{1}{2}$

⇒ 2h=r + h

⇒ h=r

Given that total surface area = 616 cm ^{2}

$\Rightarrow 2 \times \frac{22}{7} \times 2r^2 = 616$

⇒ r^2 **= 7× 7**

So, r = h = 7 cm

Volume of a cylinder = $\pi r^2 h$

$\Rightarrow \frac{22}{7} \times 49 \times 7 = 1078\ \text{cm}^3$